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ANODE SCRUBBER WASTEWATER TREATMENT OPERATING GENERAL PROCEDURES

I. Introduction

The purpose of the Anode Scrubber Wastewater Treatment Facility (ASWWTF) is twofold - to treat and recirculate back to the scrubber reusable water and to treat the blowdown from this system for reuse in the Billet Casting furnace scrubber.

To accomplish these tasks there are three major operating process systems. System 1 involves the transfer of the dirty water from the scrubber, pH adjustment, solids removal and transfer of the cleaned water back for reuse in the scrubber. System 2 involves a blowdown from System 1 to a batch treatment operation for the removal of solids and contaminants similar to the current system used for the Billet Casting Scrubber wastewater. System 3 consist of the transfer, monitoring, storage and usage of the water treated in System 2 in the Billet Casting Scrubber except that a two step pH treatment is used. Each system and its operation will be discussed in more detail below.

II. System 1 Scrubber Recirculating System (Drawing 3270-P-2)

Major Equipment List: System 1

-Holding Tank 703 (2,300 gals) (#3 Anode Furnace)
-Holding Tank 701 (2,300 gals) (#4 Anode Furnace)
-Emergency Surge Tank 702 (2,300 gals) (#4 Anode Furnace)
-Transfer Pumps 601 (3-150 gpm)
-pH Adjustment Tank 706 (12,000 gals)
-Transfer Pumps 602 (2-300 gpm)
-Caustic Soda Feed Pumps 612 (2-10 gpm)
-Caustic Soda Tank 712 (6,000 gals)
-Flash Mix Tank 704 (900 gals)
-Flocculation Tank 705 (3,000 gals)
-Lamella Sludge Pumps 605 (2-30 gpm)
-Lamella Separator 301
-Sludge Thickener Tank 707 (14,000 gals)
-Filter Press Feed Pump 606 (30 gpm)
-Lamella Effluent Tank 713 (1,500 gals)
-Polymer Feed Unit 801
-Polymer Feed Unit 802
-Effluent Pumps 613 (2-300 gpm)
-Bldg. Sump Pumps 607 (2-50 gpm)
-Filter Press 401
-Make-up Water Pumps 615 (2-100 gpm)

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When the #3 Anode Furnace is operating, wastewater from the Scrubber, Quencher and Fan sprays will discharge by gravity to Holding Tank 703. When the #4 Anode Furnace is operating that same water will discharge by gravity to Holding Tank 701. From Holding Tank 701, the water will be pumped to Holding Tank 703 with Pumps 601. Both Holding Tanks 701 & 703 have emergency

overflow capacity. Tank 701 overflows to Tank 702 and Tank 703 overflows to Tank 706. From this point forward the system will operate the same no matter which furnace is operating.

Water from Holding Tank 703 will be transferred to Flash Mix Tank 704 using Pumps 602. Flash Mix Tank 704 will also receive water from the building sump by way of Pumps 607 and any overflow from Sludge Tank 707. The purpose of Flash Mix Tank 704 is for the adjustment of the pH using caustic from Caustic Tank 712 via caustic Pump 612. The pH in Flash Mix Tank 704 will be maintained at 6.0 to 6.5 with a high/low pH alarm set point at 7.0/5.50. A mixer, Agitator 101, is provided in Flash Mix Tank 704. Water from this point in the system will flow by gravity until it is pumped from Effluent Tank 713.

Water will next flow to Flocculation Tank 705, where polymer will be added from Polymer Feed Unit 801 to form a floc. The polymer aids small particles in the water to grow into larger heavier particles. The polymer will be feed at a rate of __4__ ppm. A variable speed mixer, Agitator 102, is provided in Flocculation Tank 705. The mixer speed sjould be set at _____ rpm or ____%. The pH in Flocculation Tank 705 is also monitored and controlled with the addition of caustic to Flocculation Tank 704. The pH is maintained at 6.0 to 6.5 with a high/low pH alarm set point at 7.0/5.50. Both Tanks 704 and 705 can be drained to the building sump.

Water then flows by gravity into Lamella Separator 301. A Lamella Separator is an inclined plate settler designed to remove solids. Clean water from Lamella Separator 301 will overflow the unit into Effluent Tank 713 where it will be pumped with Pumps 613 to pH Adjustment Tank 706.

Sludge from the lamella will be pumped from the bottom using Pumps 605 to Sludge Thickener Tank 707 for further settling. The pumping of the sludge from the bottom of the Lamella will be on a timed-interval basis. The time interval of the pump operation is determined by checking the sludge level in the bottom of the Lamella using the four sample taps. If the level is above the third tap the pump operation time-interval should be increased.

Sludge in Sludge Thickener Tank 707 will be allowed to settle for additional concentrating of the solids. Once the sludge blanket reaches the _____ sample tap from the top, there is sufficient sludge to load the press and the sludge should be run through Filter Press 401 using Pump 606 to transfer the slurry. The clear overflow from Tank 707 is returned to Flash Mix Tank 704 by way of the building trench. The filtrate from the the press also is returned to Tank 704 via the building trench.

As noted above, water from Effluent Tank 713 is pumped using Effluent Pump 613 to pH Adjustment Tank 706. Tank 706's primary function is to be the reservoir for the clean Scrubber water. In addition to the recirculated water that has been treated as described above, Tank 706 receives make-up water from the pond using Make-Up Water Pumps 615. City water serves as an emergency back-up to the pond water system. A low-low water alarm and cutoff is provided to shutoff the Scrubber water pumps and shutdown the Scrubber fan and burners in the event the system fails. The addition of make-up water is controlled by an automatic level controller. Additionally pH is monitored and controlled automatically to an average pH of 6.50. A mixer, Agitator 103, is provided in Tank 706.

III. System 2 Blowdown Treatment (Drawing 3270-P-3)

Major Equipment List: System 2

-Primary Batch Tanks 709A, 709B & 709C (3-10,000 gals)
-Secondary Batch Tank 714 (1-10,000 gals)
-Batch Tank Transfer Pumps 608 (2-170 gpm)
-Batch Tanks Sludge Transfer Pumps 614 (2-30 gpm)
-Strainer 803
-Caustic Soda Feed Pumps 612 (2-10 gpm)
-Caustic Soda Tank 712 (6,000 gals)
-Sludge Thickener Tanks 711 (2-3,200 gals)
-Sludge Thickener Transfer Pumps 611 (2-30 gpm)
-Polymer Feed Unit 802
-Bldg. Sump Pumps 607 (2-50 gpm)
-Filter Press 401

The chloride level in pH Adjustment Tank 706 should not exceed 6 grams per liter at 8:00 a.m.. To control this, a portion of the flow from the Effluent Tank 713 to pH Adjustment Tank 706 will be transferred to 1 of the 3 Primary Batch Treatment Tanks depending on which tank is empty. The blowdown should start at 8:00 a.m. and continue at a flow rate of about 19 gpm for 4 hours (4,500 gal) up to a maximum of 6 hours (6,000 gals) depending on the chloride content.

Each of the Primary Batch Treatment Tanks 709A, B & C operates independently of the other and on a three day cycle. On the "first" day the first tank will be filled with blowdown. It will be cooled on the "second" day while the second tank is being filled. On the "third" day the first tank will be treated. This sequence of fill, hold and treat could be altered if the blowdown from the recirculating system is less than 5,000 gallons.

In Primary Batch Treatment Tanks 709 and Secondary Batch Treatment Tank 714 the treatment process is as follows:

1. In the 709 tank requiring treatment, with the mixer running, add caustic to bring the pH of the batch to 8.7 - 9.0, being careful not to overshoot.

2. After the pH is adjusted in Tank 709, add the flocculent to help settle the solids. Flocculant should be added using Polymer Feed Unit 802. The flocculent should be added with the mixer running. Approximately __4__ppm of flocculant should be added.

3. Turn off the mixer after 20 minutes of mixing and allow the batch to settle for ____hours.

4. The clear supernatant should next be pumped to the Secondary Batch Treatment Tank 714 using Pump 608A. Once in Tank 714. with the mixer 105 running, caustic to bring the pH to 9.7 - 10.0.

5. After the pH is adjusted in Tank 714, add the flocculant to help settle the solids. Flocculant should be added using Polymer Feed Unit 802. The flocculant should be added with the mixer running. Approximately __4__ppm of flocculant should be added.

6. Turn off the mixer after 20 minutes of mixing and allow the

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batch to settle overnight.

7. The next day a sample of the clear supernatant should be taken to the laboratory for analysis of Copper, Cadmium, Lead and Zinc. Analytical results should be logged in the logbook as they are available. Log entries are to include: Sample Name, Date, Tank Number, Analytical Results & pH.

8. If the analytical results show that the concentration of Copper, Cadmium and Lead are less than 1.50 ppm and the Zinc is less than 4 ppm then the batch can be discharged through the Strainer 803 to the Treated Water Storage Tank 710 using Pump 608B. Strainer 803 is a dual basket filtering unit. The dual basket filtering unit should be alternated so that 1 basket is used every other day.

9. Once the supernatant from Tanks 709A, B or C has been pumped to Tank 714, sludge from the bottom of Tank 709 should be pumped using Sludge Pump 614A into Thickening Tank 711A for further settling. When this tank contains enough sludge to fill Filter Press 401, it may be pumped using Pump 611 to be filtered. The filtrate will go to the trench then back to Tanks 704. Filter cake should be bagged, weighted and tagged using the appropriate filter cake designation. A sample of the cake should be brought to the lab for analysis.

10. Once the supernatant from Tanks 714 has been pumped to Treated Water Tank 710, sludge from the bottom of Tank 714 should be pumped using Sludge Pump 614B into Thickening Tank 711B for further settling. When this tank contains enough sludge to fill Filter Press 401, it may be pumped using Pump 611 to be filtered. The filtrate will go to the trench then bach to Tanks 704. Filter cake should be bagged, weighted and tagged using the appropriate filter cake designation. A sample of the cake should be brought to the lab for analysis.

IV. System 3 Treatment Water Transfer (Drawing 3270-P-3)

Major Equipment List: System 3

-Treated Water Storage Tank 710 (60,000 gals)
-Treated Water Pumps 610 (2-30 gpm)
-Sampler 804
-Existing Billet Furnace Scrubber Tank E715

The water that was treated in the Systems 1 & 2 and being stored in the Treated Water Storage Tank 710 will be used as make-up water for the Billet Furnace Scrubber to replace evaporation losses and blowdown. The blowdown from the Billet Furnace Scrubber system is generally 8,000 gallons per day. Starting about 8:00 a.m. each day, the make-up should come from Tank 710 using Pump 610 to transfer it to Tank E715. Continue to makeup water in this manner until Tank 710 is empty or a maximum of 8,000 gallons have been transferred to Tank E715. Any balance of the makeup needed for the Billet Furnace Scrubber system will be with city water.

V. Safety & Other Considerations

Safety should be the major consideration whenever performing an activity at the wastewater plant. Proper safeguards and protective equipment must be used or worn when handling the caustic and polymer, which should include gloves and faceshields. At all times the facility must be maintained in good operating and a clean and orderly fashion.

An activity logbook must be maintained by the operator. Activities must be recorded with the time and the action indicated. Also data sheets will be provided as needed for operating data entries.

	Other Addressees
CERRO COPPER PRODUCTS CO.	
INTERNAL MEMORANDUM	File

To:Distribution Date:November 30, 1990

From: J. M. Grana

Subject: Anode Scrubber Wastewater Treatment
Draft Operating Procedure

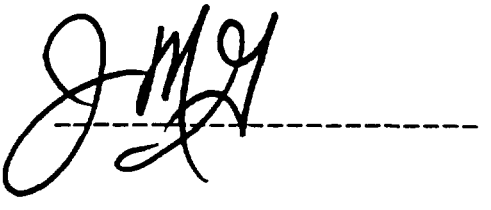
Distribution: P. Tandler
R. E. Conreaux
J. Hintz
T. Cornwell
J. Staples
E. Davis (Chester)

Attached is the draft of the new Anode Scrubber Wastewater Treatment Operating Procedures (to be known from this day forward as Water Reclamation Plant No. 2 or WRP2) for use during start-up of the new facility. The Bldg 19 Wastewater Facility should now be known as the Water Reclamation Plant No. 1 or WRP1.

These procedures do not go into great detail but should provide the operator with a basic understanding of the systems. A more detailed Operating Procedure will be written by Patterson Schafer Inc. Also it is understood that there will be several revisions to this document as our experience in operating the system becomes better.

Please make your comments and suggestions and return it to my office for the second draft to be written. The completed document will be about 4 single spaced type written pages. However, I have double spaced this draft to provide you space for comments and changes.

I have also left some information out of this draft and have indicated this with underlined blank spaces.



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ANODE SCRUBBER WASTEWATER TREATMENT OPERATING GENERAL PROCEDURES

I. Introduction

The purpose of Water Reclamation Plant No. 2 (WRP2) is twofold - to treat and recirculate back to the scrubber reusable water and to treat the blowdown from this system for reuse in the Billet Casting Furnace Scrubber.

To accomplish these tasks there are three major operating process systems. System 1 involves the transfer of the dirty water from the scrubber, pH adjustment, solids removal and transfer of the cleaned water back for reuse in the scrubber. System 2 involves a blowdown from System 1 to a batch treatment operation for the removal of solids and contaminants similar to the current system used for the Billet Casting Scrubber wastewater. System 3 consist of the transfer, monitoring, storage and usage of the water treated in System 2 in the Billet Casting Scrubber. Each system and its operation will be discussed in more detail below.

II. System 1 Scrubber Recirculating System (Drawing 3270-P-2)

Major Equipment List: System 1

-Holding Tank 703 (2,300 gals) (#3 Anode Furnace)
-Holding Tank 701 (2,300 gals) (#4 Anode Furnace)
-Emergency Surge Tank 702 (2,300 gals) (#4 Anode Furnace)
-Transfer Pumps 601 (3-150 gpm)
-pH Adjustment Tank 706 (12,000 gals)
-Transfer Pumps 602 (2-300 gpm)
-Caustic Soda Feed Pumps 612 (2-10 gpm)
-Caustic Soda Tank 712 (6,000 gals)
-Flash Mix Tank 704 (900 gals)
-Flocculation Tank 705 (3,000 gals)
-Lamella Sludge Pumps 605 (2-30 gpm)
-Lamella Separator 301
-Sludge Thickener Tank 707 (14,000 gals)
-Filter Press Feed Pump 606 (30 gpm)
-Lamella Effluent Tank 713 (1,500 gals)
-Polymer Feed Unit 801
-Polymer Feed Unit 802
-Effluent Pumps 613 (2-300 gpm)
-Bldg. Sump Pumps 607 (2-50 gpm)
-Filter Press 401
-Make-up Water Pumps 615 (2-100 gpm)

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When the #3 Anode Furnace is operating, wastewater from the Scrubber,

Quencher and Fan sprays will discharge by gravity to Holding Tank 703. When the #4 Anode Furnace is operating that same water will discharge by gravity to Holding Tank 701. From Holding Tank 701, the water will be pumped to Holding Tank 703 with Pumps 601. Both Holding Tanks 701 & 703 have emergency overflow capacity. Tank 701 overflows to Tank 702 and Tank 703 overflows to Tank 706. From this point forward the system will operate the same no matter which furnace is operating.

Water from Holding Tank 703 will be transferred to Flash Mix Tank 704 using Pumps 602. Flash Mix Tank 704 will also receive water from the building sump by way of Pumps 607 and any overflow from Sludge Tank 707. The purpose of Flash Mix Tank 704 is for the adjustment of the pH using caustic from Caustic Tank 712. The pH in Flash Mix Tank 704 will be maintained at 6.0 to 6.5 with a high/low pH alarm set point at 7.0/5.50. A mixer, Agitator 101, is provided in Flash Mix Tank 704. Water from this point in the system will flow by gravity until it is pumped from Effluent Tank 713.

Water will next flow to Flocculation Tank 705, where polymer will be added from Polymer Feed Unit 801 to form a floc. The polymer aids small particles in the water to grow into larger heavier particles. The polymer will be feed at a rate of _____ ppm. A variable speed mixer, Agitator 102, is provided in Flocculation Tank 705. The pH in Flocculation Tank 705 is also monitored and controlled with the addition of caustic to Flocculation Tank 704. The pH is maintained at 6.0 to 6.5 with a high/low pH alarm set point at 7.0/5.50. Both Tanks 704 and 705 can be drained to the building sump.

Water then flows by gravity into Lamella Separator 301. A Lamella Separator is an inclined plate settler designed to remove solids. Clean water from Lamella Separator 301 will overflow the unit into Effluent Tank 713 where it will be pumped with Pumps 613 to pH Adjustment Tank 706.

Sludge from the lamella will be pumped from the bottom using Pumps 605 to Sludge Thickener Tank 707 for further settling. The pumping of the sludge from the bottom of the Lamella will be on a timed-interval basis. The time interval of the pump operation is determined by checking the sludge level in the bottom of the Lamella using the four sample taps. If the level is above the third tap the pump operation time-interval should be increased.

Sludge in Sludge Thickener Tank 707 will be allowed to settle for addition concentrating of the solids. Once the sludge blanket reaches the _____ sample tap, the sludge should be run through Filter Press 401 using Pump 606 to transfer the slurry. The clear overflow from Tank 707 is returned to Flash Mix Tank 704 by way of the building trench.

As noted above, water from Effluent Tank 713 is pumped to pH Adjustment Tank 706. Tank 706's primary function is to be the reservoir for the clean Scrubber water. In addition to the recirculated water that has been treated as described above, Tank 706 receives make-up water from the pond using Make-Up Water Pumps 615 and as a back-up to these pumps, Tank 706 can also be feed with City Water. A low-low water alarm and cutoff is provided to shutoff the Scrubber water pumps and shutdown the Scrubber fan and burners in the event the system fails. The addition of make-up water is controlled by an automatic level controller. Additionally pH is monitored and controlled automatically to an average pH of 6.50. A mixer, Agitator 103, is provided in Tank 706.

III. System 2 Blowdown Treatment (Drawing 3270-P-3)

Major Equipment List: System 2

-Primary Batch Tanks 709A, 709B & 709C (3-10,000 gals)
-Secondary Batch Tank 714 (1-10,000 gals)
-Batch Tank Transfer Pumps 608 (2-170 gpm)
-Batch Tanks Sludge Transfer Pumps 614 (2-30 gpm)
-Strainer 803
-Caustic Soda Feed Pumps 612 (2-10 gpm)
-Caustic Soda Tank 712 (6,000 gals)
-Sludge Thickener Tanks 711 (2-3,200 gals)
-Sludge Thickener Transfer Pumps 611 (2-30 gpm)

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-Polymer Feed Unit 802
-Bldg. Sump Pumps 607 (2-50 gpm)
-Filter Press 401

Based on the chloride level in pH Adjustment Tank 706, which should be maintained between 6-8 grams/liter, a portion of the flow from the Effluent Tank 713 to pH Adjustment Tank 706 will be transferred to 1 of the 3 Primary Batch Treatment Tanks depending on which tank is empty. The blowdown should start at 8:00 a.m. and continue at a flow rate of about 19 gpm for 4 hours (4,500 gal) up to a maximum of 6 hours (6,000 gals) depending on the chloride content.

Each of the Primary Batch Treatment Tanks 709A, B & C operates independently of the other and on a three day cycle. On the "first" day the first tank will be filled with blowdown. It will be cooled on the "second" day while the second tank is being filled. On the "third" day the first tank will be treated. This sequence of fill, hold and treat could be altered if the blowdown from the recirculating system is less than 5,000 gallons.

In Primary Batch Treatment Tanks 709 and Secondary Batch Treatment Tank 714 the treatment process is as follows:

1. In the 709 tank requiring treatment, with the mixer running, add caustic to bring the pH of the batch to 9.0, being careful not to overshoot.

2. After the pH is adjusted in Tank 709, add the flocculent to help settle the solids. Flocculant should be added using Polymer Feed Unit 802. The flocculent should be added with the mixer running. Approximately _____ ml of flocculant should be added.

3. Turn off the mixer after 20 minutes of mixing and allow the batch to settle for ____hours.

4. The clear supernatant should next be pumped to the Secondary Batch Treatment Tank 714 using Pump 808A. Once in Tank 714. with the mixer running, caustic to bring the pH to 10.0.

5. After the pH is adjusted in Tank 714, add the flocculant to help settle the solids. Flocculant should be added using Polymer Feed Unit 802. The flocculant should be added with the mixer running. Approximately _____ ml of flocculant should be added.

6. Turn off the mixer after 20 minutes of mixing and allow the batch to settle overnight.

7. The next day a sample of the clear supernatant should be taken to the laboratory for analysis of Copper, Cadmium, Lead and Zinc. Analytical results should be logged in the logbook as they are available. Log entries are to include: Sample Name, Date, Tank Number, Analytical Results & pH.

8. If the analytical results show that the concentration of Copper, Cadmium and Lead are less than 0.75 ppm and the Zinc is less than 4 ppm then the batch can be discharged through the Strainer 803 to the Treated Water Storage Tank 710 using Pump 608B.

9. Once the supernatant from Tanks 709A, B or C has been pumped to Tank 714, sludge from the bottom of Tank 709 should be pumped using Sludge Pump 614A into Thickening Tank 711A for further settling. When this tank contains enough sludge to fill Filter Press 401, it may be pumped using Pump 611 to be filtered. The filtrate will go to the trench then back to Tanks 704. Filter cake should be bagged, weighted and tagged using the appropriate filter cake designation. A sample of the cake should be brought to the lab for analysis.

10. Once the supernatant from Tanks 714 has been pumped to Treated Water Tank 710, sludge from the bottom of Tank 714 should be pumped using Sludge Pump 614B into Thickening Tank 711B for further settling. When this tank contains enough sludge to fill Filter Press 401, it may be pumped using Pump 611 to be filtered.

The filtrate will go to the trench then bach to Tanks 704. Filter cake should be bagged, weighted and tagged using the appropriate filter cake designation. A sample of the cake should be brought to the lab for analysis.

IV. System 3 Treatment Water Transfer (Drawing 3270-P-3)

Major Equipment List: System 3

-Treated Water Storage Tank 710 (60,000 gals)
-Treated Water Pumps 610 (2-30 gpm)
-Sampler 804
-Existing Billet Furnace Scrubber Tank E715

The water that was treated in the Systems 1 & 2 and being stored in the Treated Water Storage Tank 710 will be used as make-up water for the Billet Furnace Scrubber. The blowdown from the Billet Furnace Scrubber system is generally 8,000 gallons per day. At the same time this system is being blowndown, makeup water from the Treated Water Storage Tank 710 should be transferred to Tank E715 using Pump 610. Continue to makeup water in this manner until Tank 710 is empty or 8,000 gallons have been transferred to Tank E715. Any balance of the makeup needed for the Billet Furnace Scrubber system will be with city water.

V. Safety & Other Considerations

Safety should be the major consideration whenever performing an activity at the wastewater plant. Proper safeguards and protective equipment must be used or worn when handling the caustic and polymer, which should include gloves and faceshields. At all times the facility must be maintained in good operating and a clean and orderly fashion.

An activity logbook must be maintained by the operator. Activities must be recorded with the time and the action indicated. Also data sheets will be provided as needed for operating data entries.